Exercise and depression in overweight and obese pregnant women: a randomised controlled trial

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Summary

Objective: To assess the effectiveness of a regular physical exercise program on the prevention of depression in overweight and obese pregnant women.

Material and method: A randomised controlled trial was conducted at Hospital Universitario de Fuenlabrada in Madrid. A total of 106 overweight and obese healthy pregnant women (32.70±3.90 years), with uncomplicated and singleton gestation were analyzed (52 to the exercise group (EG) and 54 to the control group (CG)). Women from EG participated in a physical conditioning program throughout pregnancy, which included a total of 55- to 60-minute weekly sessions, 3 days per week. The main outcome measure was the patients' depression level, assessed by the Center for Epidemiological Studies Depression scale (CES-D). Other pregnancy outcomes were measured.

Results: A smaller percentage of depressed women were identified in the EG compared to the CG in the third trimester: entire group EG: 17.8% *vs*. CG: 47.2% *p*=0.002, overweight EG: 16.2% *vs*. CG: 47.7% *p*=0.003 and adequate weight gain EG: 8.7% *vs*. CG: 62.5% *p*=0.000.

Comparations within EG showed a significantly reduce of the percentage of depressed women in the third trimester in comparison with the first one: entire group 25% vs. 15.9% *p*=0.000; overweight 24.32% *vs*. 16.2% *p*=0.003; excessive weight gain 31.57% *vs*. 26.31% *p*=0.007 and adequate weight gain: 21.73% *vs*. 8.7% *p*=0.005. Whereas this percentage tended to increase significantly within the CG.

Conclusion: An adapted exercise program designed for overweight and obese pregnant women may reduce the prevalence of depression in late pregnancy, and turn out in a longer gestational age at labour among depressive active pregnant women. Clinical Trial Register: clinicaltrials.gov NCT01753622

Key words:
Exercise. Depression. Pregnant Women. Overweight. Obesity.

Ejercicio y depresión en mujeres embarazadas con sobrepeso y obesidad: ensayo clínico aleatorio

Resumen

Objetivo: Evaluar la eficacia de un programa de ejercicio físico regular en la prevención de la depresión en mujeres gestantes con sobrepeso y obesidad.

Material y método: Se llevó a cabo un ensayo clínico aleatorio en el Hospital Universitario de Fuenlabrada en Madrid. Un total de 106 mujeres gestantes sanas con sobrepeso y obesidad (32,70±3,90 años), sin complicaciones y con gestación simple fueron analizadas (52 en el grupo de ejercicio (GE) y 54 en el grupo de control (GC)). Las mujeres del GE participaron en un programa de acondicionamiento físico durante el embarazo, incluyendo sesiones semanales de 55 a 60 minutos, 3 días a la semana. La variable principal de estudio fue el nivel de depresión de las pacientes, evaluado a través de "Center for Epidemiological Studies Depression scale (CES-D)". Otros resultados del embarazo fueron medidos.

Resultados: Se identificó un menor porcentaje de mujeres con depresión en el GE en comparación con el GC en el tercer trimestre de embarazo: grupo entero GE: 17,8% *vs*. GC: 47,2% *p*=0,002, sobrepeso GE: 16,2% *vs*. GC: 47,7% *p*=0,003 y ganancia de peso adecuada GE: 8,7% *vs.* GC: 62,5% *p*=0,000.

Las comparaciones dentro del GE mostraron una reducción significativa del porcentaje de mujeres con depresión en el tercer trimestre de embarazo en comparación con el primer trimestre: grupo entero 25% *vs*. 15,9% *p*=0,000; sobrepeso 24,32% *vs.* 16,2% *p*=0,003; ganancia de peso excesiva 31,57% *vs*. 26,31% *p*=0,007 y ganancia de peso adecuada: 21,73% *vs*. 8,7% *p*=0,005. Mientras que este porcentaje tendió a incrementarse significativamente dentro del GC.

Conclusión: Un programa adaptado de ejercicio físico diseñado para mujeres con sobrepeso y obesidad puede reducir la prevalencia de depresión al final del embarazo, y resultar en una edad gestacional más prolongada en el momento del parto entre las gestantes deprimidas físicamente activas.

Registro Ensayo Clínico: clinicaltrials.gov NCT01753622.

Palabras clave:
Ejercicio. Depresión. Mujer embarazada. Sobrepeso. Obesidad.

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Introduction

Being overweight or obese in developed societies is a negative trait, particularly for women[1]. The preoccupation with weight loss and staying slim has been shown to lead to mental health complications[2,3].

This feeling of dissatisfaction with the size and shape of one's body is normal among pregnant women[4], but it is concerning because of its association with several adverse pregnancy outcomes. Evidence indicates that maternal antenatal depression increases the risk of pregnancy complications, such as preterm birth, intrauterine growth restriction[5-7], childhood overweight problems[8] and impaired cerebral development[9].

In addition, perinatal depression has been associated with increased gestational weight gain[10], which has short- and long-term consequences, such as gestational diabetes[11], pre-eclampsia[12], Caesarean delivery[12], macrosomia or large-for-gestational-age birth weight[12,13], maternal postpartum weight retention[13] and overweight offspring[14].

Starting a pregnancy in an overweight or obese condition is a risk factor for depression[15-17], with a prevalence of approximately 20%[18]. It is also associated with several maternal and fetal complications[19-22] and an increased risk of exceeding the Institute of Medicine (IOM) weight recommendation for overweight pregnant women[23,24]. However, the number of women who are entering pregnancy either overweight or obese is rising[25]; the prevalence of maternal overweight has increased from 24% in 1983 to 44% in 2007[26,27].

This study is the first randomised controlled trial examining the importance of physical exercise in preventing depressive disorders in obese and overweight pregnant women based on their adherence to the IOM weight gain recommendations[28].

The hypothesis was that during pregnancy, a regular physical exercise program based on aerobic dance, strength exercise and pelvic floor training protects against depression among overweight and obese pregnant women.

Our secondary hypothesis was that this adapted exercise program prevented excessive weight gain, decreased the risk of depression (even in cases in which the women gained excessive gestational weight) and resulted in fewer adverse infant outcomes compared to the infants of depressed women in a control group (CG).

The aim of this study was to assess the effectiveness of a regular physical exercise program on depression and gestational weight gain in overweight and obese pregnant women.

Material and methods

This randomised controlled trial (RCT) (ID: NCT01753622) was conducted from October 2009 to January 2013.

According to the inclusion criteria, only overweight and obese pregnant women without any obstetrics complications (according to the American College of Obstetricians and Gynaecologists' [ACOG] 2002 guidelines)[29] were invited to participate. Height and pre-gestational weight were collected from the patient's medical records at the first prenatal visit. A total of 106 pregnant women (87 overweight, 19 obese, mean age 32.70 ± 3.90 years) were randomly allocated into two groups: 52 to the exercise group (EG) and 54 to the CG.

All participants provided signed written informed consent prior to participating in the study. The study was approved by the Research Ethics Committee of Hospital Universitario de Fuenlabrada (Madrid, Spain) and was performed according to the ethical guidelines of the Declaration of Helsinki, which was last modified in 2008.

A computer-generated list of random numbers was used to allocate the participants into the groups. The randomisation blinded process (sequence generation, allocation concealment and implementation) was performed by three different authors.

Sample Size: To detect a 25% reduction in a percentage of depressed women in the EG compared to the CG in late pregnancy, with a two-sided 5% significance level and a power of 80%, a sample size of 50 pregnant women per group was necessary given an anticipated dropout rate of 15%[30].

The women randomly allocated to the CG received general care from health professionals, and in telephone interviews, they reported no regular exercise during their pregnancies. Conversely, women who were randomly allocated to the EG received general care and participated in specific exercise programs designed for overweight and obese healthy pregnant women.

Exercise intervention

The exercise intervention program started at 8–11 gestational weeks and finished at 38 – 39 gestational weeks. The women exercised for an average of 25.83 ± 3.33 weeks, and a total of 85 sessions were planned for each participant. The women who did not meet the minimum required attendance of 80% of the sessions were excluded from the statistical analysis.

The exercise program was designed following the ACOG guidelines (29) to ensure that it was safe and effective for pregnant women.

The women wore heart rate monitors (Accurex Plus, Polar Electro OY, Finland) during all sessions to meet the intensity target of 55 – 60% of their heart rate reserve using the Karvonen formulation[31]. Borg's scale rate of perceived exertion (RPE)[32] was also used and ranged from 10 to 12 ("fairly light" to "somewhat hard", respectively).

The exercise program was performed three times per week on alternate days. Each session lasted between 55 and 60 minutes. The structure was the same in all of the sessions; the women started with a warm-up that consisted of 5 minutes of walking at different intensities, static stretching of most muscle groups and joint mobility exercises. In the same manner, 5 – 10 minutes at the end of each session was spent on the cool-down, including relaxing exercise, static stretching and partner massages.

After the warm-up, the women participated in aerobic activities, the main objective of which was to reach and hold 55 – 60% of intensity for 20 minutes. To achieve this goal, different musical style choreography was used. Some specific exercises were then performed to increase muscle strength and to improve balance and to prevent some muscle imbalances that are common among pregnant women.

The session finished with 10 minutes of pelvic floor muscle training to prevent urinary incontinence.

Extreme stretching, joint overextension, the Valsalva manoeuvre, ballistic movements and jumps were avoided, and exercises performed

in the supine position on the mat were not performed for more than 2 minutes.

All sessions were supervised by a qualified fitness specialist (working with groups of 10–12 subjects) with an obstetrician's assistance. The exercises were performed in a spacious, well-lit room under favourable environmental conditions (altitude 600 m, temperature 19–21 ºC, humidity 50–60%). An adequate intake of calories and nutrients was confirmed before the start of each exercise session.

Measures

BMI was calculated by dividing the pre-pregnancy weight (kg) by height (m^2), and women were classified as overweight (BMI ≥25 to 29.9 kg/m^2) (CG N = 45, EG N = 42) or obese (BMI ≥30 kg/m^2) (CG N = 9, EG N = 10).

Primary outcome: Depression levels were assessed using the Center for Epidemiological Studies Depression scale (CES-D) at the beginnings (weeks 8–11) and ends (weeks 38–39) of the pregnancies. This scale was developed by the National Institute of Mental Health and is a structured, self-administered questionnaire that consists of 20 items assessing the different aspects of depressive symptomatology. Each response is scored from 0 (never) to 3 (all the time) according to the symptom frequency. The score is the sum of the 20 weighted items, and the maximum score is 60. If more than 4 items are missing, the test cannot be considered. A threshold of 16 (≥16) indicates depression.

Maternal gestational weight gain from the beginning to the end of the pregnancy and fetal outcomes were considered as secondary outcomes. Maternal weight gain was provided by the health centre and categorised using pre-pregnancy weight status as excessive or adequate. Excessive gestational weight gain was defined as a weight gain of >11.5 kg for overweight pregnant women and >9.0 kg for obese pregnant women, according to the IOM recommendations[28], which are based on optimising short- and long-term maternal and child health outcomes.

Fetal outcomes were collected from the medical records at delivery, such as birth weight (g), gestational age (days), Apgar score (1–5 min), head circumference (HC) (cm), type of labour and pH of umbilical cord.

Analysis

All analyses were performed using the Statistical Package for Social Sciences (SPSS) program, version 20.0.

Student's t-test was used to assess the primary outcome, the CES-D score, between the EG and the CG and within the groups and also to analyse the rest of the continuous and normally distributed variables regarding the maternal characteristics and fetal outcomes.

A Chi-square (χ^2) test was used to analyse the categorical and nominal variables for the maternal characteristics, gestational weight gain, percentage of depressive women and fetal outcomes.

An interim analysis to assure the safety of the intervention was performed during the trial (N = 3 0). The levels of significance maintained an overall *p* value of 0.05 and were calculated according to the O'Brien-Fleming stopping boundaries[33].

Data are shown as means ± standard deviations, and *p*-values ≤ 0.05 indicated statistical significance. Cohen's d was used to determine the effect size in the means comparisons and contingency coefficient in percentage comparisons. An effect size ranging from 0 to 0.20 was considered a small effect size, 0.20 - 0.50 was a moderate effect size, and >0.5 was a large effect size[34].

Results

A total of 148 pregnant women were interviewed. The results regarding adherence to the protocol were as follows: 10 women in the EG were lost to follow-up because of discontinued intervention (N = 5), pregnancy-induced hypertension (N = 2) and personal reasons (N = 3). A total of 10 participants in the CG were excluded from the study because of premature delivery (N = 1), pre-induced hypertension (N = 5) and personal reasons (N = 4). Three women in the EG were excluded for not adhering to the minimum exercise program requirements. Finally, 106 overweight and obese women were analysed, 52 in the EG and 54 in the CG (Figure 1).

To assess the effect of exercise on depression based on pre-gestational BMI and gestational weight gain, the data are shown in five categories: the entire group, overweight, obese, excessive weight gain and adequate weight gain.

Maternal outcomes

Personal data were collected from all participants at the beginning of the study, as shown in Table 1. No significant differences were identified.

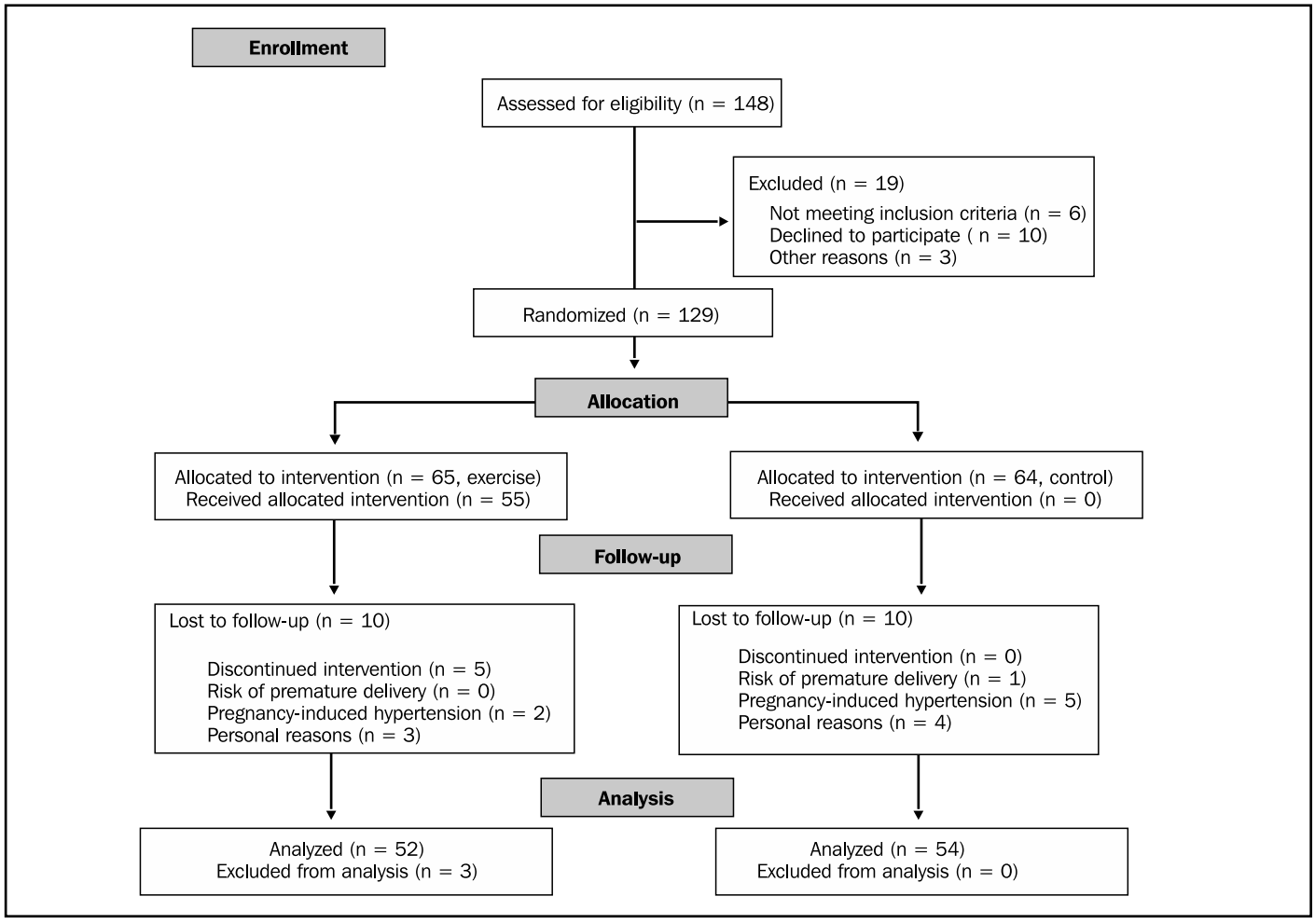
Level of depression

Women started the study with the same level of depression in both study groups (p >0.05) (Table 1). However, significantly lower scores on the CES-D scale were noted in the third trimester for the EG for the entire group ($t_{94.16}$= 3.45; p = 0.001) and for the overweight ($t_{77.46}$= 3.28, p = 0.002) and adequate weight gain (t_{38}=4.06, p=0.000) subgroups. The effect sizes were large: 0.69, 0.72 and 1.34, respectively (Table 2).

Regarding the percentage of depressed women, there were significantly lower percentages in the EG compared to the CG for the entire group (χ^2_1= 9.41, p = 0.002, odds ratio [OR] = 0.242, 95% confidence interval [CI], 0.09-0.61) and for the overweight (χ^2_1 = 8.98, p = 0.003, OR = 0.212, 95% CI, 0.07-0.60) and adequate weight gain subgroups (χ^2_1 = 12.82, p = 0.000, OR = 0.057, 95% CI, 0.009–0.335). The effect sizes were 0.29, 0.31 and 0.49, respectively (Table 2).

The exercise program had a significant positive effect on the incidence of depression. The percentage of depressed women (CES-D score ≥16) in the EG was significantly lower in the third trimester compared to the first trimester for the entire group (χ^2_1 = 16.36, p = 0.000) and for the overweight (χ^2_1 = 13.54, p = 0.003), excessive weight gain (χ^2_1 = 7.36, p = 0.007) and adequate weight gain subgroups (χ^2_1 = 7.88, p = 0.005), with large effect sizes (except for overweight, which was moderate) (Table 3). Conversely, the data showed a significant increase in the percentage of depressed women in the CG in the third trimester for the entire group (χ^2_1 = 8.62, p = 0.003) and for the overweight (χ^2_1 = 5.98, p = 0.014) and excessive weight gain (χ^2_1 = 7.70, p = 0.006) subgroups (Table 3).

Figure 1. CONSORT 2010 flow diagram of the study participants.



Maternal gestational weight gain

Significantly more pregnant women in the EG gained an appropriate amount of weight according to the IOM recommendations compared to women in the CG, who tended to gain more weight than recommended (χ^2_1= 4.24, p = 0.03) (Figura 2). The effect size was moderate (d = 0.20) (Figura 2).

Effect of exercise on fetal outcomes in depressed women in the third trimester

Depressed women in the EG had significantly longer gestational age than depressed women in the CG for the entire group ($t_{89.85}$= -3.18, p = 0.002) and for the overweight ($t_{75.21}$=-3.10, p = 0.003) and excessive weight gain (t_{55} = -2.43, p = 0.01) subgroups (Table 4). No statistical differences were identified for the rest of the fetal outcomes regarding depressed pregnant women (p >0.05) (Table 4).

Discussion

There are several principal findings from this RCT. The first is the effectiveness shown by the regular exercise program in protecting against depression not only in overweight pregnant women but also among overweight and obese women who gained excessive and adequate gestational weight. The exercise program significantly decreased the percentage of depressed pregnant women from the beginnings to the ends of their pregnancies, whereas this percentage tended to increase significantly among sedentary pregnant women.

Only one RCT was found that assessed the effect of a lifestyle intervention in mental health among obese pregnant women[35], but the authors did not report an effect on depression. The different results reported for depression may be because the intervention differed. Their intervention was based on four antenatal lifestyle intervention sessions with a midwife who was trained in motivational intervention instead of a physical exercise program, as in the present study.

A prospective intervention study[36] observed fewer depressive symptoms in obese physically active pregnant women than in inactive obese pregnant women. All women were instructed to register every activity that entailed activity with the intensity of a brisk walk or greater for at least 30 minutes over a 15-week period.

The second main finding was the usefulness demonstrated by this specific exercise program for helping overweight and obese pregnant

Table 1. Maternal characteristics in the exercise and control groups.

Variable	EG (N=52)	CG (N=54)	*P*
Age (years)	31.98±3.74	33.39±3.98	0.06
BMI*	27.88±3.11	28.00±2.62	0.83
Pre-pregnancy BMI (n/%)			
Overweight 25/29.9	42/80.8	45/83.3	0.73
Obesity >30	10/19.2	9/16.7	
Smoking during pregnancy (n/%)			
No	37/92.5	17/89.5	0.69
Yes	3/7.5	2/10.5	
Occupation (n/%)			
Housewife	20/38.5	14/26.4	0.21
Sedentary job	20/38.5	19/35.8	
Active job	12/23.1	20/37.7	
Abortion (n/%)			
No previous	33/63.5	38/70.4	0.44
One previous	14/26.9	14/25.9	
Two or more	5/9.6	2/3.7	
Preterm labour (n/%)			
No	51/98.1	53/98.1	0.97
Yes	1/1.9	1/1.9	
Education (n/%)			
Primary	8/15.4	17/31.5	0.08
Higher	24/46.2	16/29.6	
University	20/38.5	21/38.9	
CES-D score at first trimester			
Entire group	11±9.15	13.46±10.43	0.20
Overweight	11.36±9.55	13.33±10.30	0.35
Obese	9.33±7.21	14.11±11.65	0.16
Excessive gain weight	11.48±9.54	13.31±10.62	0.51
Adequate weight gain	9.80±8.31	13.88±10.54	0.16
Depressed in first trimester (n/%)			
Entire group	14/27.5	18/33.3	0.51
Overweight	11/26.2	16/35.6	0.34
Obese	3/33.33	2/22.22	0.59
Excessive gain weight	6/28.6	12/34.3	0.65
Adequate weight gain	6/24	5/31.30	0.60

*BMI (body mass index at the beginning of the study). Center for Epidemiological Studies Depression scale (CES-D). Depressed (CES-D score≥16).

women gain an appropriate amount of weight. Although overweight women are more likely to exceed the IOM recommendations[23], our data showed that it was possible to control this weight gain through a specific physical exercise program, even among obese pregnant women. Many studies have reported similar results, but usually with combined nutritional and exercise interventions[37-42]. Only three randomised controlled trials were identified that reported successful prevention of excessive weight gain among overweight or obese pregnant women with only a physical exercise intervention[35,43,44].

Table 2. CES-D scores and percentage comparisons between study groups in the third trimester.

	EG	CG	*P*	Effect size
Entire group (N=98)				
CES-D score	9.33±7.17	15.26±9.76	0.001*	0.69
Depressed women (n/%)	8/17.8	25/47.2	0.002*	0.29
Overweight (N=81)				
CES-D score	9±7	15.09±9.64	0.002*	0.72
Depressed women (n/%)	6/16.2	21/47.7	0.003*	0.31
Obese (N=17)				
CES-D score	10.88±8.21	16.11±10.85	0.28	
Depressed women (n/%)	2/25	4/44.4	0.402	
Excessive weight gain (N=55)				
CES-D score	11.20±8.57	14.34±9.84	0.23	
Depressed women (n/%)	5/30	15/42.9	0.345	
Adequate weight gain (N=39)				
CES-D score	7.21±5.67	17.71±9.49	0.000*	1.34
Depressed women (n/%)	2/8.7	10/62.5	0.000*	0.49

Center for Epidemiological Studies Depression scale (CES-D). Depressed (CES-D score≥16).

Table 3. Incidence of depression within each study group from the first to third trimesters.

	First Trimester	Third Trimester	*p*	Effect size
Entire group				
EG (N=44) Depressed women (n/%)	11/25	7/15.9	0.000*	0.52
CG (N=53) Depressed women (n/%)	17/32.07	25/47.2	0.003*	0.37
Overweight				
EG (N=37) Depressed women (n/%)	9/24.32	6/16.2	0.003*	0.37
CG (N=44) Depressed women (n/%)	15/34.09	21/47.7	0.014*	0.34
Obese				
EG (N=7) Depressed women (n/%)	2/28.57	1/14.3	0.08	
CG (N=9) Depressed women (n/%)	2/22.22	4/44.44	0.07	
Excessive weight gain				
EG (N=19) Depressed women (n/%)	6/31.57	5/26.31	0.007*	0.52
CG (N=35) Depressed women (n/%)	12/34.28	15/42.9	0.006*	0.42
Adequate weight gain				
EG (N=23) Depressed women (n/%)	5/21.73	2/8.7	0.005*	0.50
CG (N=16) Depressed women (n/%)	5/31.25	10/62.5	0.33	

Depressed (CES-D score ≥16).

Table 4. Comparison of neonatal outcomes in depressive women between the study groups.

	Pre-gestational BMI									Gestational weight gain					
	Entire group			Overweight			Obese			Excessive			Adequate		
	EG	CG	*P*	EG	CG	*p*	EG	CG	*P*	EG	CG	*p*	EG	CG	*P*
Birth weight (g.)	3,347 ±307.04	3,346± 307.04	0.99	3,292 ±404.80	3.253 ±1.68	0.72	3.309 ±402.91	3.156 ±408.31	0.42	3.381 ±349.25	3.366 ±427.80	0.89	3.163 ±423.05	3.010 ±698.26	0.42
Gestational age (days)	279.48 ±7.61	273.32 ±11.71	0.002*	279.65 ±8.15	272.64 ±12.31	0.003*	278.80 ±5.16	276.67 ±7.90	0.49	280.86 ±6.86	275.49 ±8.81	0.01*	277.67 ±8.22	269.88 ±15.47	0.07
Apgar score															
1 min.	9.13 ±0.64	8.44 ±1.73	0.28	8.82 ±1.12	8.64 ±0.86	0.40	8.88 ±1.53	8.22 ±2.77	0.53	8.91 ±0.97	8.63 ±1.47	0.43	8.68 ±1.46	8.41 ±1.12	0.53
5 min.	9.88 ±0.35	9.56 ±0.91	0.35	9.77 ±0.53	9.77 ±0.52	0.97	10±0	9.56 ±1.33	0.34	9.77 ±0.52	9.74 ±0.74	0.87	9.86 ±0.46	9.71 ±0.68	0.39
HC (cm)	34.93 ±1.34	34.43 ±2.05	0.52	34.51 ±1.33	34.34 ±1.68	0.62	34.36 ±1.23	34.77 ±1.46	0.52	34.75 ±1.25	34.67 ±1.34	0.83	34.18 ±1.36	34.01 ±2.10	0.75
pH	7.25 ±0.06	7.25 ±0.06	0.96	7.28 ±0.07	7.27 ±0.08	0.65	7.26 ±0,07	7.28 ±0.07	0.71	7.27 ±0.06	7.28 ±0.08	0.75	7.28 ±0.07	7.25 ±0.08	0.44
Type of delivery (n/%)															
Normal	4/50	10/40		21/51.2	21/47.7		6/66.7	5/55.6		10/45.5	17/48.6		14/58.3	9/52.9	
Instrumental	1/12.5	2/8	0.76	7/17.1	8/18.2	0.94	1/11.1	0/0	0.41	6/27.3	5/14.3	0.44	2/8.3	3/17.6	0.66
Caesarean	3/37.5	13/52		13/31.7	15/34.1		2/22.2	4/44.4		6/27.3	13/37.1		8/33.3	5/29.4	

HC: Head circumference.

The first study used a sample of 205 obese pregnant women and found a reduction in gestational weight gain in obese pregnant women. The intervention consisted of four antenatal lifestyle intervention sessions by a midwife trained in motivational lifestyle intervention[35].

The second study allocated 82 overweight and obese pregnant women into an exercise group (N = 40) that exercised under supervision and received home exercise counselling and a control group (N = 42) that followed routine prenatal care. The authors demonstrated that overweight pregnant women who exercised gained less weight during their entire pregnancies (10.0 ± 1.7 kg vs. 16.4 ± 3.9 kg, respectively, $p = 0.001$) and after entry into the study (5.9 ± 4.3 kg vs. 11.9 ± 1.5 kg, respectively, $p = 0.021$)[43].

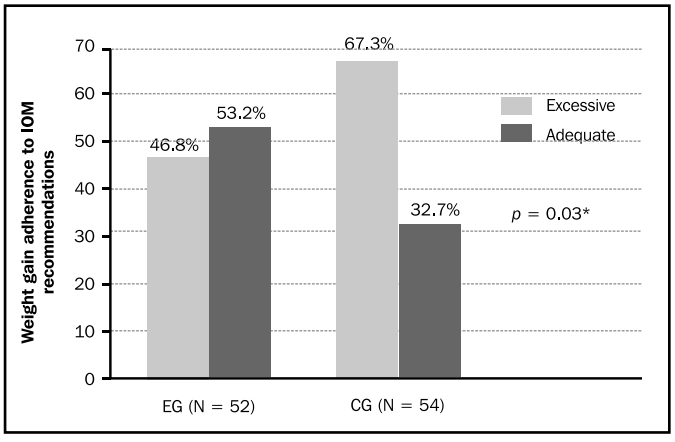
The third study enrolled 150 previously sedentary obese pregnant women. Women allocated to the intervention group were involved in organised exercise training three times per week, and the control group received standard antenatal care. The authors found that training managed to reduce the gestational weights of the obese women compared to the controls[44].

Another prospective case-control intervention study[45] reported significantly lower weight gain in obese pregnant women who were involved in an intervention program with weekly motivational talks and aqua aerobic classes (n = 155) compared with a sedentary control group (n = 193). However, the authors did not specify whether their study was randomised.

One other relevant finding from this study must be emphasised. Our data showed that depressed pregnant women in the EG had significantly longer gestational ages than the women in the CG. When noting the adverse risk of preterm delivery associated with depression[5-7], the exercise program may be considered as a type of protection. This protection effect of exercise on preterm delivery has been observed by other authors studying pregnant women[46-48], but it has not been demonstrated in an RCT assessing depressed pregnant women.

To the best of our knowledge, this study is the first RCT that has investigated the effect of a regular physical exercise program designed for overweight and obese pregnant women on preventing depression based on gestational weight. Furthermore, the study is also unique because of the role that the exercise program played in infant outcomes for the children of depressed overweight and obese pregnant women.

Figure 2. Adherence to the IOM weight gain recommendations in each study group.



The main limitation from this study is the small sample size, particularly when data were stratified by categories for both pre-gestational BMI and gestational weight gain.

So what?

What is already known on this topic?

The recent increase in worldwide obesity affects all sections of the population, the pregnant woman is not immune to this problem, on the other had many scientific evidence has shown the dangerous association between obesity and other emotional disturbances such as depression, for mother and new born. Only a few studies examine whether moderate physical exercise can reduce or prevent gestational depression.

What does this article add?

This study is the first clinical trial investigating the complex association between obesity and depression during pregnancy using an attractive and appropriate intervention for pregnant women: A program of moderate and supervised exercise throughout pregnancy.

What are the implications for health promotion practice or research?

Currently most of the strategies to reduce this problem (obesity and depression during pregnancy) are failing. The results of this study provide to the health professionals a new and interesting strategy to solve the problem without risk for mother, fetus and new born. Because of the study results, regular physical exercise should be considered as part of routine pregnancy care for overweight and obese women. Indeed, an adapted exercise program designed for overweight and obese pregnant women may reduce the prevalence of depression in late pregnancy among overweight women independently of whether gestational weight gain is appropriate, may optimise gestational weight gain and may facilitate achieving longer gestational ages among depressed overweight women.

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Conflict of interest

None of the authors have a conflict of interest.

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